

Plant Scherer NPDES Permit No. GA0035564
Renewal Application Item Number 8

The information below summarizes Georgia Power Company water quality studies of Lake Juliette in the presence of discharges from outfall number 04, Service Water Final Discharge.

TROPHIC STATE INDEX OF LAKE JULIETTE, CALCULATED FROM T-PO4, CHL a, AND SECCHI DEPTH NEAR THE DAM FOREBAY

<u>Year</u>	<u>T-PO4</u>	<u>CHLa</u>	<u>Secchi Depth</u>	<u>Mean TSI</u>
1994	43	19	45	36
1995	not sampled in 1995			
1996	not sampled in 1996			
1997	37	33	50	40
1998	ND*	51	46	48
1999	37	33	50	40
2000	ND	29	49	39

ND = not detected (<0.02 ppm)

FECAL COLIFORM DATA

<u>Year</u>	<u>n</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Mean</u>
1994	4	0	0	0
1995	0	not sampled in 1995		
1996	0	not sampled in 1996		
1997	1			10
1998	1			5
1999	3	5	10	7

Lake Juliette stratifies thermally and chemically during the summer months. Extensive aquatic plants in the lake are believed responsible for clear water. Chlorophyll *a* and total phosphorus values are low, with secchi depth values ranging from 4-18.5 ft., with a mean of 10.47 ft, resulting in Trophic State Index estimates in the mesotrophic range as calculated by Carlson (1977). Coliform data indicate values acceptable for contact recreation.

The 2001 edition of Guidelines for Eating Fish From Georgia Waters, 2001 indicates no fish consumption advisory for Lake Juliette. This is based on GA DNR analysis of 43 separate contaminants, including metals, organic chemicals, and pesticides.

Based on the information summarized from Georgia Power Reservoir Water Quality reports, and GA DNR fish consumption advisory data, it appears that Lake Juliette has acceptable water quality for fishing and contact recreation.

EVALUATION OF WATER QUALITY IN GEORGIA POWER RESERVOIRS DURING 2001

Introduction

Georgia Power Company's reservoirs were sampled during 2001 to evaluate basic water chemistry, temperature, and dissolved oxygen (DO). Water clarity was also measured using a Secchi disc. This report summarizes by reservoir: temperature, DO, secchi depth, total phosphorus (T-PO₄), chlorophyll *a* (Chla), and fecal coliform data. Estimates of each reservoir's trophic status are also provided.

Reservoir DO values are a function of air temperature, mixing by wind or other forces, plankton photosynthesis, and oxygen consuming materials in the water column. Adequate DO is necessary for a healthy population of fish and invertebrates in our reservoirs.

Total phosphorus measurements provide an estimate of the nutrient most likely limiting phytoplankton growth. Chla data measure photosynthetic pigment found in phytoplankton and reflect available nutrients, flow, temperature, reservoir stratification, turbidity, and many other factors. These two measurements describe an important nutrient and phytoplankton biomass, which is the base of the reservoir food chain.

Secchi values measure the depth at which a circular disc disappears in the water column. These values are a function of phytoplankton growth and non-algal turbidity entering from the watershed. Water green with phytoplankton or brown from non-algal turbidity will have a shallower secchi depth than water with little phytoplankton or non-algal turbidity.

Fecal coliform data indicate possible sanitary waste inflows from upstream sources or leaking septic systems. Fecal data may also reflect runoff from pasturelands and deposits by waterfowl.

Chla, secchi depth, and T-PO₄ data are used to estimate reservoir trophic status using methods developed by Dr. Bob Carlson in 1977. Trophic ranges include oligotrophic, mesotrophic, and eutrophic, which are descriptors of reservoir productivity. Dr. Carlson's Trophic State Index (TSI) ranges are:

Less than or equal to 30	- Oligotrophic
Greater than 30 and less than 60	- Mesotrophic
Greater than or equal to 60	- Eutrophic

Oligotrophic reservoirs are low in productivity, have very clear water, and support few pounds of fish per acre. At the other extreme, eutrophic reservoirs are very productive, and may be dark green due to dense phytoplankton. Mesotrophic reservoirs are between the extremes. Eutrophic waters generally have more pounds of fish per acre, and higher biomass of microscopic phytoplankton and/or aquatic plants. Eutrophic waters may experience very high and very low DO concentrations during a diel (day/night) cycle.

Methods

Water chemistry and temperature / DO profiles were collected at GPC reservoirs at least three times during 2001, except Harding was sampled twice for chemical parameters. Goat Rock, North Highlands, Oconee, and Oliver were sampled quarterly. The remaining reservoirs were sampled during June, August, and November. New field profile equipment allowed turbidity data to be collected in place of oxidation/reduction potential data.

Chemistry samples were collected at the dam forebays except for:

- | | |
|----------|--|
| Burton | - Goldmine Branch subdivision, Timpson Cove beach, and Tallulah River near the runoff from the new golf course |
| Harding | - Mountain Oak Creek |
| Oconee | - Dam forebay (surface, middle and bottom), Lick Creek, and Sugar Creek |
| Rabun | - Rabun beach |
| Seed | - Recreation / beach area |
| Sinclair | - Four Main Channel Sites (SI), including the dam forebay
Four Cove Sites (SC), selected from an intensive study of coves in 1998.
Selective sampling continues in order to evaluate trends. |

Chemistry sample analyses included T-PO₄, Chla, and fecal coliform data described in this report. Other analyses varied depending on re-licensing status, local interest, and other requests. All results are summarized by reservoir and sampling location in the Appendix. Data are maintained in the Environmental Laboratory water quality database.

Independent contractors sampled weekly at GPC beaches from the last week of May to Labor Day weekend. These beaches were analyzed for fecal coliform: Burton, Seed, Tallulah Falls (two locations), Jackson, Oconee, and Sinclair. Values exceeding the recreation standard (200/100ml) over two consecutive days will result in beach closure until daily sampling indicates a geometric mean less than 200/100 ml over the previous four samples.

Results and Discussion

Table 1 contains mean summer (June-September) temperature, DO, and secchi depth. Mean summer temperatures and DO values for each reservoir are shown in bar graph form in Figure 1. The “n” values in this and other tables represent the number of data points used to calculate averages.

Average water chemistry (T-PO₄, Chla) and fecal coliform data for each reservoir are shown in Table 2. The fecal coliform “greater than” values were used to calculate averages reported in Table 2. Figure 2 is a graph of the average and maximum fecal coliform data compared to the State DNR recreation standard. Figure 7 is a graph of beach fecal coliform analyses by independent contractors.

The trophic status of each reservoir calculated from T-PO₄, Chla, and secchi depth is noted in Table 3. The average trophic status for each reservoir is shown in Figure 3. Also noted in Figure 3 are dividing lines for eutrophic, mesotrophic, and oligotrophic status.

The mean, minimum and maximum analyte values including standard deviation for each reservoir are summarized in the Appendix. A list of detection limits for each analysis is also contained in the Appendix. Note that the analysis minimum results are raw values – any result less than the detection limits for a sample should be considered as “less than” the noted detection limit.

During summer (June-September), the three warmest (mean water column) reservoirs were Sinclair Coves (30.0°C) and Oliver / North Highlands (tied at 28.8°C), as noted in Table 1. They were 1.8 and 0.4/0.2°C cooler, respectively, than in 2000. Each of these reservoirs is thermally mixed, without cooler bottom waters normally found in southeastern reservoirs. Sinclair is mixed due to pump/storage operations. Oliver and North Highlands are mixed due to their short detention times (2.4 days or less at average flow).

The three coolest reservoirs, Tugalo (16.0°C), Tallulah Falls (19.87°C), and Burton (19.9°C), develop significant summer stratification. Tugalo was 1.6°C cooler; Tallulah Falls was 2°C cooler; and Burton was 1.3°C cooler, respectively, in 2001 compared to 2000.

The data in Table 1 indicate that the GA State DO reservoir standards (5.0 mg/l daily average, no measurement less than 4 mg/l, at 1 meter depth) were met in all reservoirs. The two reservoirs with the highest mean water column DO were Sinclair Coves (7.7 mg/l) and Seed (7.4 mg/l). These DO values, respectively, were 0.6 and 0.5 mg/l higher in 2001 compared to 2000.

The lowest mean water column DO of 3.4 mg/l was at Harding. This value was 0.3 mg/l lower than the lowest mean water column value for 2000 (Harding, 3.7 mg/l). Unpublished data from West Point Reservoir indicate low DO water discharges from it may affect Lake Harding. Also, Lake Harding experiences significant temperature stratification during summer, which helps deplete oxygen below the thermocline. The average DO in Harding at 1 meter during summer was 6.9 mg/l, in compliance with the GA State standard.

Tugalo had the highest average fecal coliform value, 25/100 ml for 2001 (Table 2), which was higher than 1/100 ml found in 2000. The maximum value of 152/100 ml was found in Oconee, on February 21, station 9, and was reported as “greater than” 152/100 ml. Tugalo had the second highest maximum coliform value of 76/100ml. The GA DNR standard for fecal coliform of 200/100 ml requires a log mean of four successive measurements over 30 days to exceed 200/100ml. None of the reservoir means exceeded 200/100 ml as noted in Figure 2.

No beaches were closed as a result of beach fecal coliform analyses. There were three beaches that exceeded the recreation standard in 2000 (Jackson, Seed and Tallulah Falls).

Figure 3 indicates that the mean TSI of all GPC reservoirs continues to be in the mesotrophic range. This year Tallulah Falls exhibited the maximum TSI value, due to a single total phosphorus value of 0.11 mg/l and two zero values (Table 2, and the Appendix). The TSI calculation log function excluded the zero values, inflating the apparent “mean” for Tallulah Falls. Normally, Lakes Harding, Jackson, Oconee and Sinclair exhibit higher average TSI values, and the North Georgia lakes exhibit minimum TSI values.

All of the mean Chla values in GPC reservoirs noted in Table 2 are lower than standards set by the GA DNR for lakes Walter F. George (15-18 µg/l), Jackson (20 µg/l), and West Point (27 µg/l). These standards represent the upper expected mean Chla levels, with higher levels resulting in eutrophic conditions, and State action to reduce mean Chla levels. Lake Sinclair (Coves and Main Channels) continues to have the upper levels of Chla in GPC reservoirs (Table 2). The maximum Chla value of 23.1 µg/l was noted in Sinclair Coves (Appendix).

However, the overall mean Chla values in 2000 (2.9 µg/l) were higher than those for 2001 (1.4 µg/l, assuming a “1” for each <1 value in Table 2). Mean total phosphorus values for 2001 (0.02 mg/l) were slightly higher than those for 2000 (0.01 mg/l), assuming a 0.01 value for reservoir means reported as “<0.01 mg/l”. This may be related to the drought conditions the State has been in for the last 3 years, as Chla values would be expected to increase with increased phosphorus values.

Previous reports indicated higher Chla and total phosphorus values in Lake Oconee, particularly Lick and Sugar Creeks. This year mean Chla values (<1 µg/l) were much lower than previously noted (14 µg/l in 2000) while total phosphorus values remained the same (0.03mg/l). The US Department of Agriculture in Watkinsville GA continues to work on methods to reduce non-point source loading to the Oconee watershed. Information about the Oconee River Basin Agricultural Conservation Efficacy (ORBACE) project can be found on the web at:

<http://www.speru.ars.usda.gov/orbace1.html>

Three reservoirs (Harding, Oconee, and Sinclair Main Channels) have data for which TSI values are calculated from 1979 (Figures 4-6, respectively). Available data was used to calculate TSI values, and for some years only T-PO4 or secchi values were available. TSI values calculated from Chla for Harding have declined yearly from 1997 to 2000, and this year noted a slight increase from 34 to 35. Oconee and Sinclair TSI estimates continue to be in the upper mesotrophic range.

The heavy metal arsenic was detected at Goat Rock, Station 5 (Dam forebay) on Feb. 14, 2001 at 0.0011 mg/l (detection limit 0.001 mg/l). Analyses for heavy metals were performed on samples from Goat Rock, Oliver, and North Highlands only. No other heavy metals were detected during 2001. Total suspended solids (TSS) in this sample were 3 mg/l. This sample was not filtered before analysis, and the metal detected was likely part of the water column TSS.

The GA DNR assesses the levels of metals and pesticides in fish and issues consumption guidelines to protect consumers. Fish consumption guidelines (2001 Update) from the GA DNR can be found on their web site (<http://www.dnr.state.ga.us>) by selecting the Environmental icon as noted below and finding Guidelines for Eating Fish in the resulting page:

Parks

Historic

Environmental

P2AD

Coastal

Wildlife



Click on “[Fish Consumption Guidelines](#)” and go to “Fish Consumption Guidelines, 2001 edition” to find consumption limitations that currently exist in Georgia Power reservoirs. These include: Burton, Goat Rock, Harding, Jackson, Oconee, Oliver, Rabun, Tugalo and Worth. These guidelines are very conservative and recommend safe consumption levels based on fish type, size, meal frequency (no restrictions, one/week, or one/month), and whether you are pregnant.

Summary

GPC reservoirs have good water quality overall. Boating, fishing, and swimming are encouraged at appropriate sites.

The Trophic State Index shows our reservoirs to be in the Mesotrophic range. Lakes Harding, Jackson, Oconee and Sinclair are the most productive reservoirs, while the North Georgia reservoirs are the least productive, excluding Tallulah Falls which appears to be an anomaly in 2001. Oconee and Sinclair Trophic State Indices are remarkably stable over the past 22 years. The Trophic Status of Harding appears to be on a downward trend since 1994.

Fecal coliform values at one GPC beach (Seed) exceeded 200/100 ml. Heavy metals detected in our reservoirs are likely from suspended solids that come from the watershed. GPC intends to continue monitoring its reservoirs on a regular basis to document water quality conditions and trends.

**TABLE 1. AVERAGE SUMMER (JUNE-SEPTEMBER) FIELD WATER QUALITY DATA
MEASURED IN GPC RESERVOIRS DURING 2001**

	MEAN WATER COLUMN TEMP. (C)		MEAN WATER COLUMN D.O. (MG/L)		MEAN D.O. AT 1 METER (MG/L)		MEAN SECCHI DEPTH (FT)	
	n	n	n	n	n	n	n	n
BURTON	19.9	134	7	134	7.9	14	11.2	13
GOAT ROCK	27.9	30	5	30	5.4	3	6	3
HARDING	23.7	149	3.4	149	6.9	9	6	6
JACKSON	24.4	137	4.4	137	9.1	12	4.1	12
JULIETTE	22.7	73	4.8	73	7.8	6	9	6
N. HIGHLANDS	28.8	26	5.6	26	5.9	3	7.5	2
OCONEE	28.6	109	4.4	109	6	8	3	9
OLIVER	28.8	56	5.8	56	6.6	6	5.9	6
RABUN	20.2	74	6.4	74	7.7	6	11.2	6
SEED	20.4	68	7.4	68	8.5	8	10.1	7
SINCLAIR MAIN CHANNEL	27.5	92	4.9	92	6.9	8	2.4	8
SINCLAIR COVES	30	18	7.7	18	7.6	6	2.1	8
TALLULAH FALLS	19.8	32	5.4	32	7.6	2	8.4	2
TUGALO	16	110	5.8	110	7.6	6	8.9	6
WORTH	26.4	79	5.4	79	6.2	10	4.4	10
YONAH	23.1	67	6.4	67	7.4	6	10	6

NOTE: WATER COLUMN DATA ARE AVERAGES OF SURFACE TO BOTTOM DATA
COLLECTED AT ALL SAMPLING SITES IN EACH RESERVOIR

VALUES OF "n" ARE NUMBER OF MEASUREMENTS USED TO CALCULATE AVERAGES

**TABLE 2. SELECTED AVERAGE WATER CHEMISTRY DATA COLLECTED
AT THE SURFACE IN GPC RESERVOIRS, 2001**

<u>RESERVOIR</u>	<u>T-PO4</u> (mg/l)	<u>n</u>	<u>CHLOROPHYLL a</u> (ug/l)	<u>n</u>	<u>FECAL COLIFORM</u> (#/100 ml)	<u>n</u>	<u>MAXIMUM COLIFORM</u>
BURTON	0.01	6	1.2	6	4	9	19
GOAT ROCK	0.01	8	<1	8	3	8	7
HARDING	0.02	2	1.6	2	2	2	5
JACKSON	0.01	3	<1	3	0	3	0
JULIETTE	<0.01	3	<1	3	0	3	0
N. HIGHLANDS	0.01	4	<1	4	4	4	7
OCONEE	0.03	12	<1	12	18	12	152
OLIVER	0.01	4	<1	4	3	4	5
RABUN	<0.01	3	1.1	3	6	3	15
SEED	<0.01	3	<1	3	2	3	5
SINCLAIR COVES	0.04	12	3	12	18	12	49
SINCLAIR MAIN CHANNEL	0.03	12	4	12	6	12	31
TALLULAH FALLS	0.04	3	1.1	3	14	3	42
TUGALO	0.02	3	1.3	3	25	3	76
WORTH	0.02	3	1.8	3	17	3	29
YONAH	<0.01	3	1.1	3	5	3	13

NOTE: DATA ARE AVERAGES OF ALL WATER CHEMISTRY SAMPLES COLLECTED IN EACH RESERVOIR.
VALUES UNDER "n" ARE NUMBERS OF SAMPLES USED TO CALCULATE AVERAGES.

**TABLE 3. TROPHIC STATUS OF GPC RESERVOIRS, CALCULATED FROM
T-PO4, CHLa, AND SECCHI DEPTH, 2001**

	TROPHIC STATUS			MEAN TROPHIC STATUS
	T-PO4	CHLa	SECCHI	
BURTON	41	32	52	42
GOAT ROCK	41	24	51	39
HARDING	47	35	51	44
JACKSON	37	27	53	39
JULIETTE	*	25	49	37
N. HIGHLANDS	40	28	51	40
OCONEE	52	28	53	44
OLIVER	41	29	51	40
RABUN	*	31	48	40
SEED	37	28	49	38
SINCLAIR COVES	57	38	56	50
SINCLAIR MAIN CHANNEL	53	38	54	48
TALLULAH FALLS	72	29	51	51
TUGALO	49	33	51	44
WORTH	47	32	54	44
YONAH	37	31	50	39

* ND=NOT DETECTED

** MEAN TROPHIC STATUS CALCULATION BASED ON CHLa AND SECCHI DEPTH ONLY WHERE T-PO4 NOT DETECTED

FIGURE 1. AVERAGE SUMMER TEMPERATURE AND DISSOLVED OXYGEN (WATER COLUMN AND 1M DEPTH) IN GPC RESERVOIRS, 2001

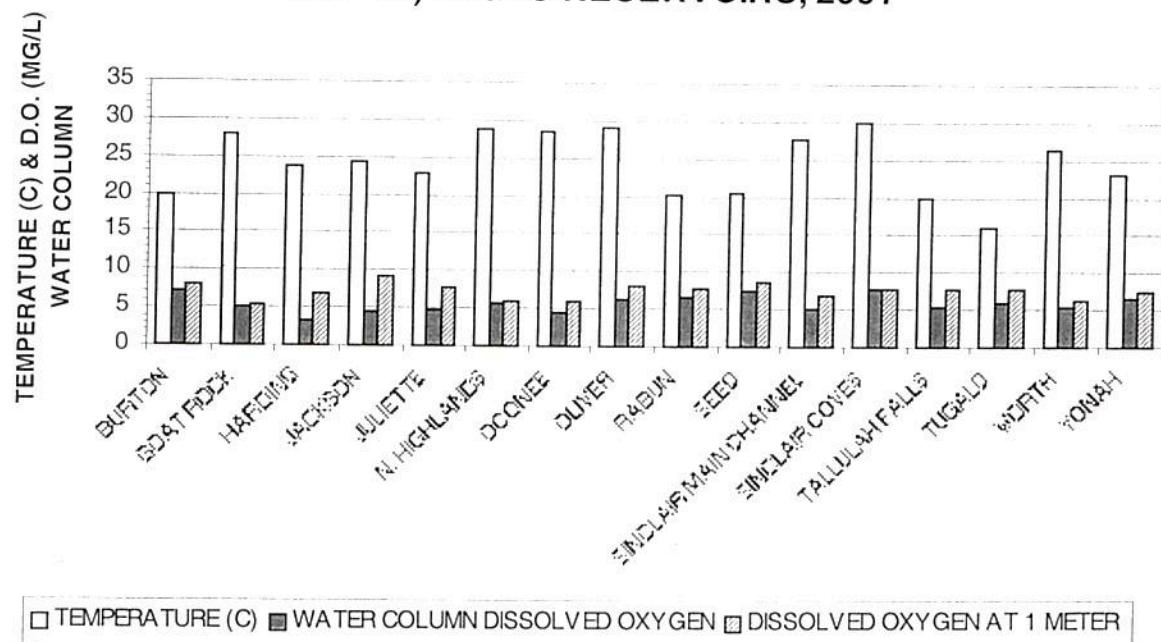


FIGURE 2. AVERAGE AND MAXIMUM FECAL COLIFORM DATA COLLECTED FROM GPC RESERVOIRS, 2001

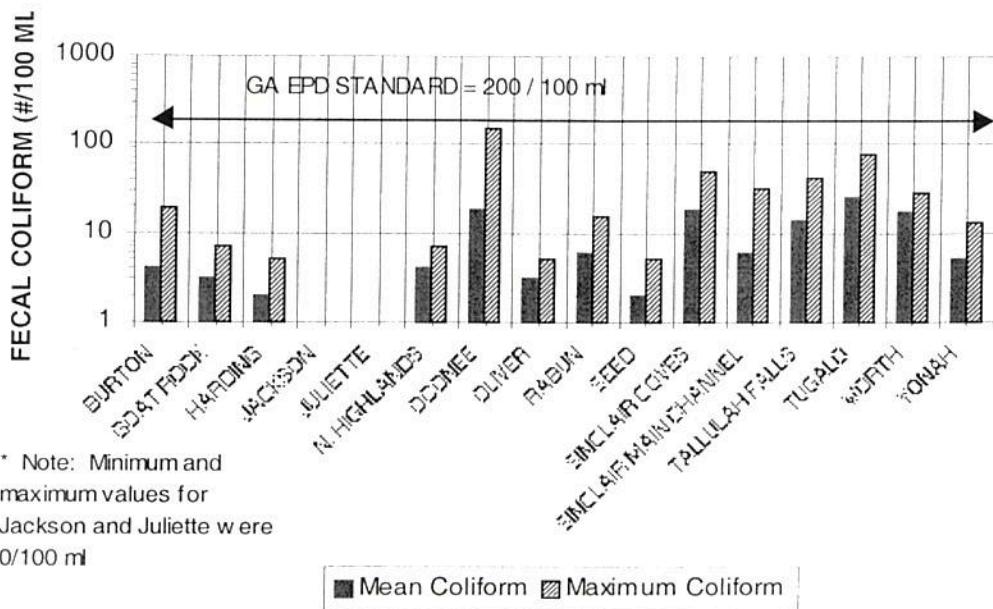


FIGURE 3. AVERAGE TROPHIC STATUS OF GPC RESERVOIRS, 2001, CALCULATED FROM TOT-P, CHLa, AND SECCHI DEPTH

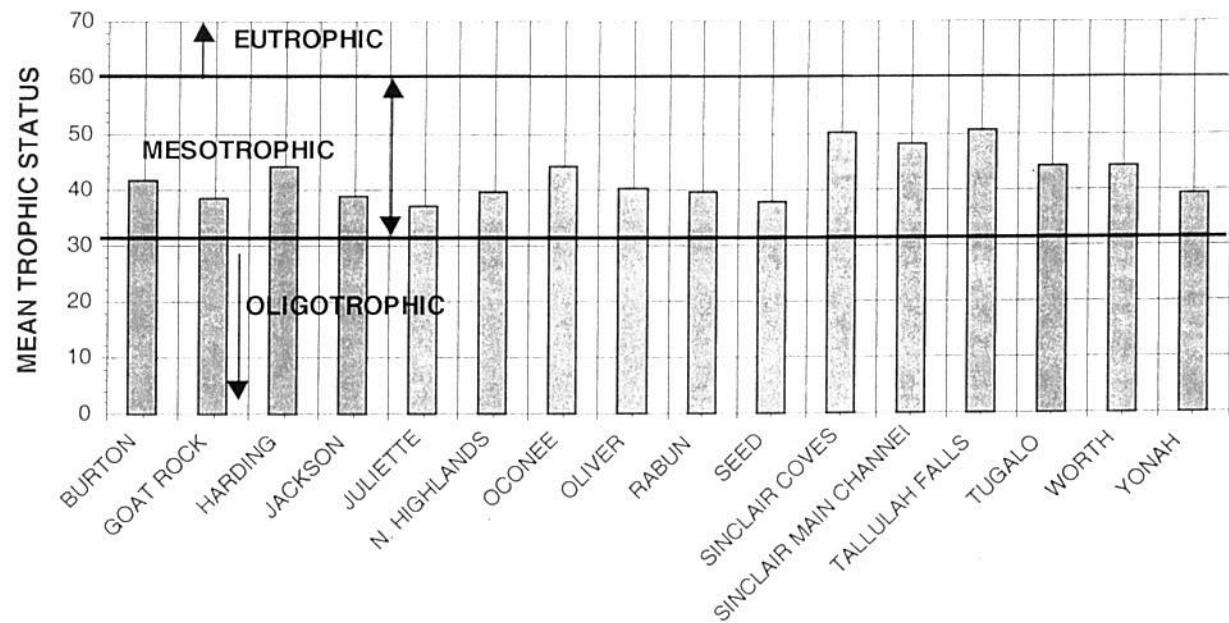
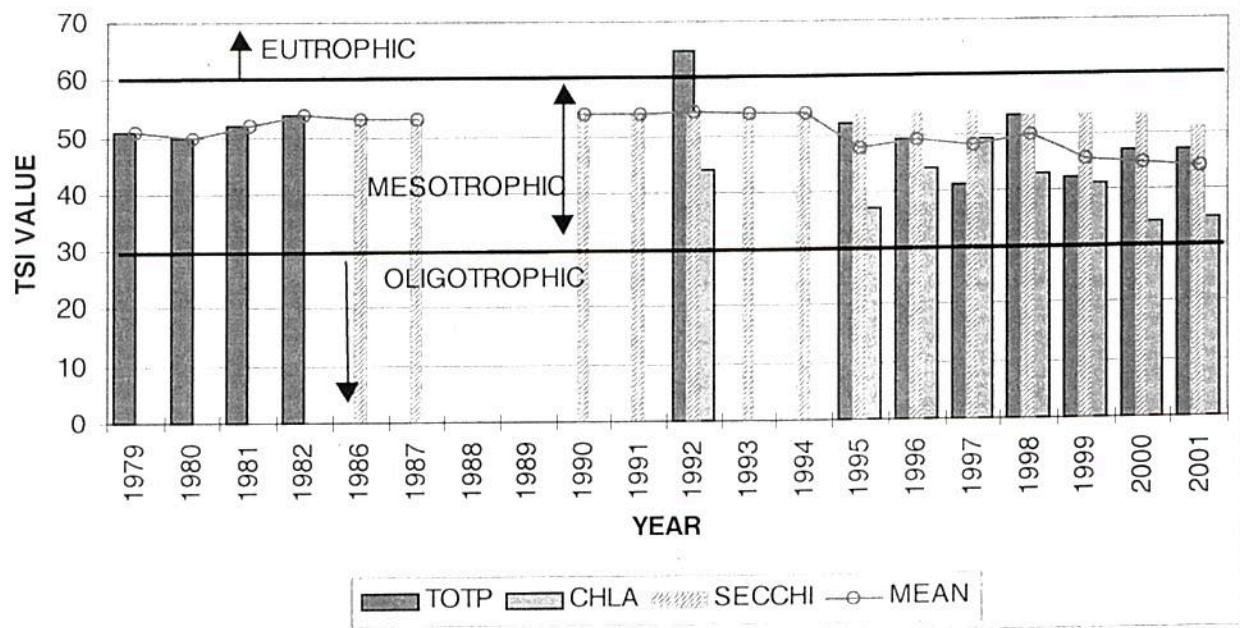
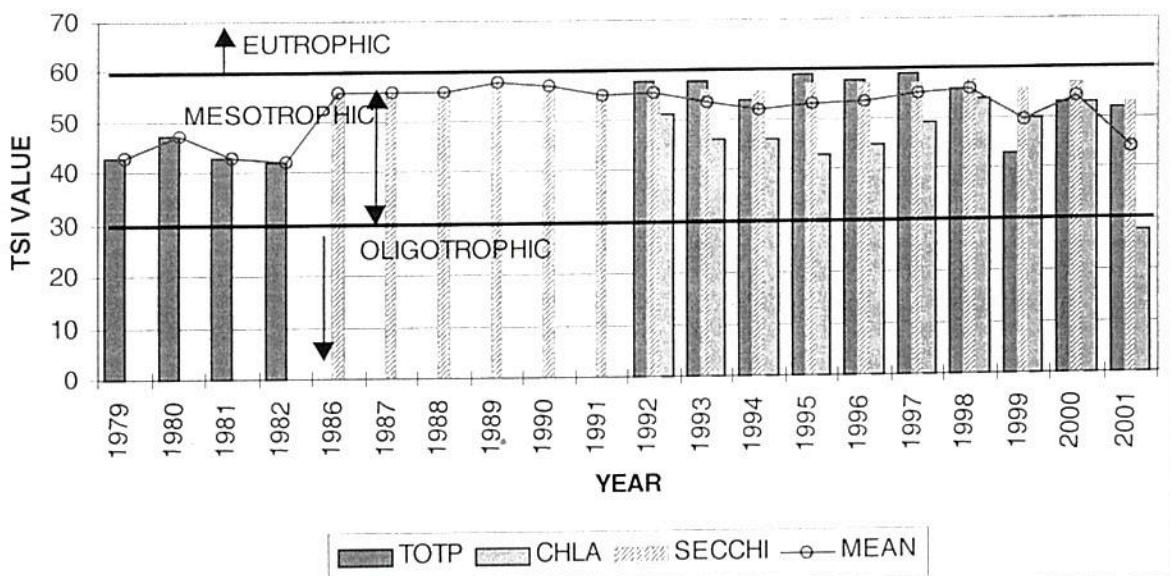


FIGURE 4. HARDING TROPHIC STATE ESTIMATES, 1979-2001



**FIGURE 5. OCONEE TROPHIC STATE ESTIMATES,
1979-2001**



**FIGURE 6. SINCLAIR TROPHIC STATE ESTIMATES,
1979-2001**

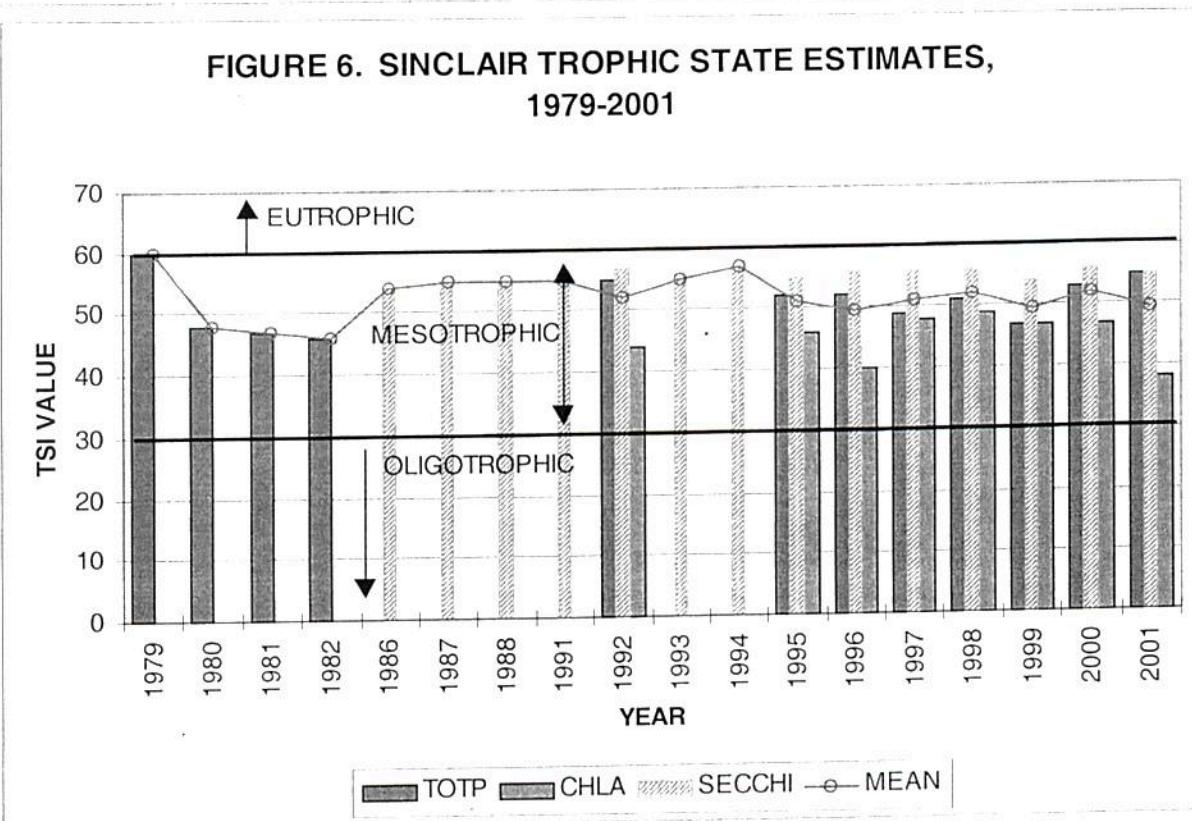
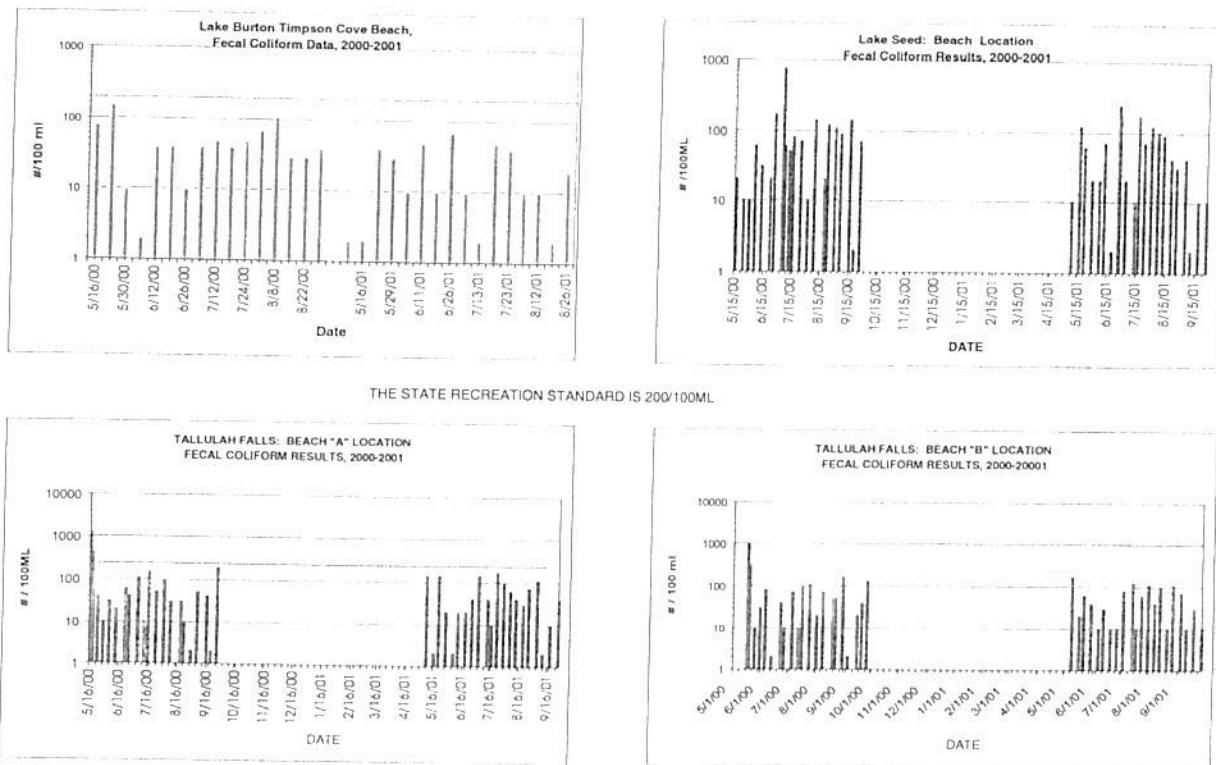


FIGURE 7. GPC BEACH COLIFORM DATA, 2001

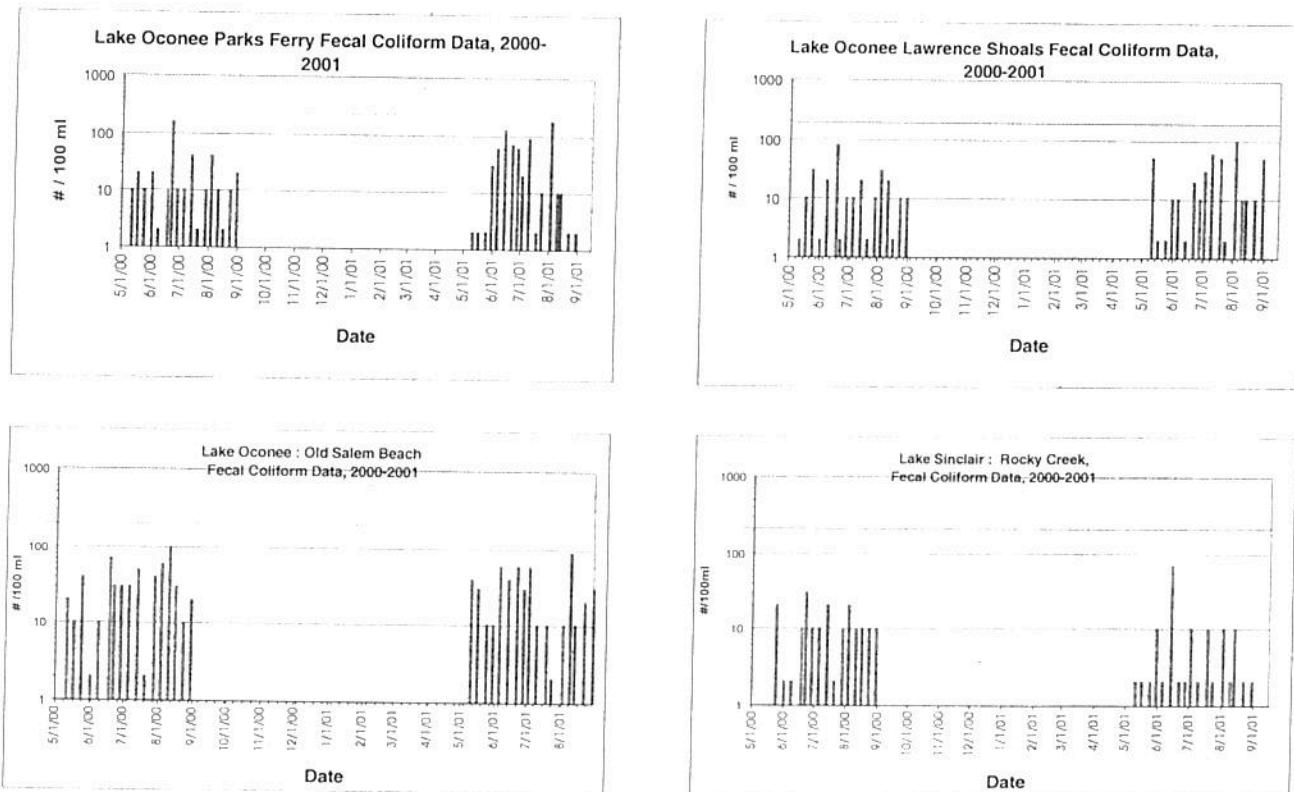
NORTH GEORGIA RESERVOIR BEACH FECAL COLIFORM DATA



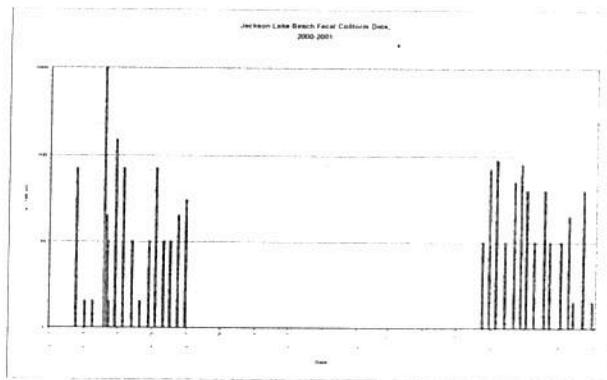
Note : Non-detected coliforms are plotted as a “2” in order to show a data point

FIGURE 7. GPC BEACH COLIFORM DATA, 2001 (continued)

MIDDLE GEORGIA RESERVOIR BEACH COLIFORM DATA



THE STATE RECREATION STANDARD IS 200/100ML



NOTE : NON-DETECTED COLIFORMS ARE PLOTTED AS A "2"
IN ORDER TO SHOW A DATA POINT

APPENDIX

GPC RESERVOIR WATER CHEMISTRY DATA SUMMARY, 2001

Reservoir site abbreviations are: BU= Burton, GR= Goat Rock, HA= Harding, JA= Jackson, JU = Juliette, NH = North Highlands, OC = Oconee, OL= Oliver, RA= Rabun, SC= Sinclair Cove, SE= Seed, SI= Sinclair Main Channel, TA= Tallulah Falls, TU= Tugalo, WO= Worth, YO= Yonah

Note: Data in the following pages are raw laboratory numbers. Results (including negative numbers) reported as less than the following detection limits should be considered as "less than" the detection limit for the parameter. The letter "n" is the number of analyses.

<u>DETECTION LIMIT</u>	<u>ANALYTE</u>
2	Alkalinity
0.03	Ammonia
0.001	Arsenic
2	Biochemical Oxygen Demand
0.004 -0.005	Cadmium
0.051-0.210	Calcium
1.0	Chlorophyll a
0.011	Copper
0	Fecal Coliform
0.053-0.064	Iron
0.011	Lead
0.085-0.088	Magnesium
0.003-0.005	Manganese
0.00015	Mercury
0.026-0.028	Nickel
0.053-0.030	Nitrate
0.006	Selenium
0.010	Total Phosphorus
1.00	Total Suspended Solids
0.05	Turbidity

NOTE: All detection limits are in mg/l, except chlorophyll a, which is in ug/l; fecal coliform which is in colonies/100ml, and turbidity which is in NTU. Ranges in detection limits are due to laboratory Quality Control revisions or subcontractor detection limits for samples analyzed by contractors.

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD. DEV.
Burton	SURFACE	TOTAL SAMPLES	70	0.00000	47.34886	6.26404	11.73685
Burton	SURFACE	Alkalinity	6	8.50000	10.10000	9.38333	0.64317
Burton	SURFACE	Ammonia	4	0.00170	0.03390	0.01243	0.0144
Burton	SURFACE	Calcium	6	1.32600	1.65552	1.55162	0.12242
Burton	SURFACE	Chlorophyll a	6	0.72620	1.68920	1.22730	0.44848
Burton	SURFACE	Fecal Coliform	9	0.00000	19.00000	4.22222	5.82619
Burton	SURFACE	Magnesium	6	0.44810	0.62698	0.51895	0.06199
Burton	SURFACE	Nitrate	6	0.00000	0.09350	0.02942	0.04569
Burton	SURFACE	Nitrite	6	0.00000	0.00000	0.00000	0.00000
Burton	SURFACE	TSI CHLOROPHYLL a	6	27.43038	35.71211	31.99555	3.75364
Burton	SURFACE	TSI TOTAL PHOSPHORUS	3	37.35368	47.34886	40.68540	5.77072
Burton	SURFACE	Total Phosphorus	6	0.00000	0.02000	0.00667	0.00816
Burton	SURFACE	Turbidity	6	1.30000	2.20000	1.68333	0.41673
Goat Rock	SURFACE	TOTAL SAMPLES	180	-0.00650	47.34886	4.83792	10.61738
Goat Rock	SURFACE	Alkalinity	8	16.90000	29.20000	24.87500	4.50420
Goat Rock	SURFACE	Ammonia	6	0.00000	0.28800	0.07122	0.10866
Goat Rock	SURFACE	Arsenic	8	-0.00038	0.00108	0.00009	0.00046
Goat Rock	SURFACE	Bioch Oxygen Demand	6	0.24000	0.95000	0.56667	0.30781
Goat Rock	SURFACE	Cadmium	8	-0.00170	0.00120	0.00011	0.00091
Goat Rock	SURFACE	Calcium	8	3.94700	7.84301	6.15298	1.43681
Goat Rock	SURFACE	Chlorophyll a	8	0.12450	1.44630	0.63480	0.45554
Goat Rock	SURFACE	Copper	8	-0.00010	0.00560	0.00239	0.00241
Goat Rock	SURFACE	Fecal Coliform	8	0.00000	7.00000	3.12500	2.58775
Goat Rock	SURFACE	Iron	8	0.13280	0.61990	0.28909	0.18821
Goat Rock	SURFACE	Lead	8	-0.00015	0.00298	0.00127	0.00106
Goat Rock	SURFACE	Magnesium	8	1.35700	1.82462	1.63023	0.16265
Goat Rock	SURFACE	Manganese	8	0.02120	0.16484	0.07770	0.05048
Goat Rock	SURFACE	Mercury	8	-0.00006	0.00008	0.00003	0.00004
Goat Rock	SURFACE	Nickel	8	-0.00650	0.00360	-0.00000	0.00293
Goat Rock	SURFACE	Nitrate	8	0.30380	1.05340	0.58855	0.28941
Goat Rock	SURFACE	Nitrite	8	0.00000	0.08240	0.04646	0.03126
Goat Rock	SURFACE	Selenium	8	-0.00015	0.00125	0.00051	0.00051

ALL VALUES IN MG/L, EXCEPT CHLA WHICH IS IN UGL, TURBIDITY, WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL
 TSI CALCULATIONS BASED ON CHLA AND TOTP VALUES GREATER THAN ZERO

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD. DEV.
Goat Rock	SURFACE	TSI CHLOROPHYLL a	8	10.13756	34.18909	23.71628	7.68670
	SURFACE	TSI TOTAL PHOSPHORUS	8	37.35368	47.34886	41.10187	5.17300
	SURFACE	Total Phosphorus	8	0.01000	0.02000	0.01375	0.00518
	SURFACE	Total Suspended Solids	8	0.75000	3.00000	2.09375	0.82208
	SURFACE	Turbidity	8	1.70000	8.30000	4.02500	2.36205
Harding	SURFACE	TOTAL SAMPLES	23	0.00000	47.34886	11.45431	16.34278
	SURFACE	Alkalinity	2	28.60000	30.00000	29.30000	0.98995
	SURFACE	Ammonia	1	0.06330	0.06330	0.06330	0.06330
	SURFACE	Calcium	2	7.15700	8.23082	7.69391	0.75931
	SURFACE	Chlorophyll a	2	1.29230	1.93580	1.61405	0.45502
	SURFACE	Fecal Coliform	2	0.00000	5.00000	2.50000	3.53553
	SURFACE	Magnesium	2	1.67700	1.75043	1.71372	0.05192
	SURFACE	Nitrate	2	0.32680	0.75690	0.54185	0.30413
	SURFACE	Nitrite	2	0.00000	0.08750	0.04375	0.06187
	SURFACE	TSI CHLOROPHYLL a	2	33.08460	37.04892	35.06676	2.80320
	SURFACE	TSI TOTAL PHOSPHORUS	2	47.34886	47.34886	47.34886	0.00000
	SURFACE	Total Phosphorus	2	0.02000	0.02000	0.02000	0.00000
	SURFACE	Turbidity	2	5.60000	6.10000	5.85000	0.35355
	SURFACE	TOTAL SAMPLES	35	0.00000	37.40000	9.38376	13.78274
Jackson	SURFACE	Alkalinity	3	23.70000	37.40000	30.50000	6.85055
	SURFACE	Ammonia	2	0.00000	0.01720	0.00860	0.01216
	SURFACE	Calcium	3	6.27900	10.66490	8.37810	2.19897
	SURFACE	Chlorophyll a	3	0.44860	0.86750	0.72033	0.23561
	SURFACE	Fecal Coliform	3	0.00000	0.00000	0.00000	0.00000
	SURFACE	Magnesium	3	1.53500	2.33630	1.88308	0.41087
	SURFACE	Nitrate	3	0.16680	0.76750	0.38173	0.33481
	SURFACE	Nitrite	3	0.00000	0.07930	0.04627	0.04127
	SURFACE	TSI CHLOROPHYLL a	3	22.70481	29.17795	26.93163	3.66294
	SURFACE	TSI TOTAL PHOSPHORUS	3	37.35368	37.35368	37.35368	0.00000

ALL VALUES IN MG/L EXCEPT CHLA WHICH IS IN UGL. TURBIDITY, WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL
TSI CALCULATIONS BASED ON CHLA AND TOTP VALUES GREATER THAN ZERO

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD. DEV.
Jackson	SURFACE	Total Phosphorus	3	0.01000	0.01000	0.01000	0.00000
Jackson	SURFACE	Turbidity	2	0.40000	4.30000	3.26667	0.96090
Ju iette	SURFACE	TOTAL SAMPLES	32	0.00000	35.52981	5.97560	10.44318
Ju iette	SURFACE	Alkalinity	3	26.50000	28.90000	27.93333	1.26623
Ju iette	SURFACE	Ammonia	2	0.00590	0.01020	0.00805	0.00304
Ju iette	SURFACE	Calcium	3	6.54800	6.63578	6.60061	0.04642
Ju iette	SURFACE	Chlorophyll a	3	0.31150	1.65810	0.76927	0.76987
Ju iette	SURFACE	Fecal Coliform	3	0.00000	0.00000	0.00000	0.00000
Ju iette	SURFACE	Magnesium	3	2.09500	2.29812	2.17277	0.10960
Ju iette	SURFACE	Nitrate	3	0.00000	0.08540	0.02847	0.04931
Ju iette	SURFACE	Nitrite	3	0.00000	0.00000	0.00000	0.00000
Ju iette	SURFACE	TSI CHLOROPHYLL a	3	19.12667	35.52981	24.86331	9.244626
Ju iette	SURFACE	TSI TOTAL PHOSPHORUS	0				
Ju iette	SURFACE	Total Phosphorus	3	0.00000	0.170000	0.00000	0.49329
N. Highland	SURFACE	TOTAL SAMPLES	90	-0.00350	47.34886	5.06098	10.79815
N. Highland	SURFACE	Alkalinity	4	18.80000	28.80000	24.90000	4.57675
N. Highland	SURFACE	Ammonia	3	0.00000	0.08200	0.04533	0.04168
N. Highland	SURFACE	Arsenic	4	-0.00037	0.00036	0.00030	0.00030
N. Highland	SURFACE	Bioch Oxygen Demand	3	0.38000	0.98000	0.62333	0.31565
N. Highland	SURFACE	Cadmium	4	-0.00050	0.00104	0.00021	0.00069
N. Highland	SURFACE	Calcium	4	4.17200	7.12235	6.04234	1.29491
N. Highland	SURFACE	Chlorophyll a	4	0.40580	1.66990	0.92360	0.59507
N. Highland	SURFACE	Copper	4	0.00200	0.00655	0.00356	0.00231
N. Highland	SURFACE	Fecal Coliform	4	2.00000	7.00000	3.50000	2.38048
N. Highland	SURFACE	Iron	4	0.15996	0.74440	0.31494	0.28645
N. Highland	SURFACE	Lead	4	0.00150	0.00483	0.00265	0.00151
N. Highland	SURFACE	Magnesium	4	1.41500	1.77886	1.63372	0.15484
N. Highland	SURFACE	Manganese	4	0.02960	0.12490	0.06285	0.04234
N. Highland	SURFACE	Mercury	4	-0.00005	0.00011	0.00003	0.00007

ALL VALUES IN MG/L EXCEPT CHLA WHICH IS IN ug/L, TURBIDITY, WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL
TSI CALCULATIONS BASED ON CHLA AND TOTP VALUES GREATER THAN ZERO

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD.DEV.
N. Highland	SURFACE	Nickel	4	-0.00350	0.00200	0.00012	0.00249
	SURFACE	Nitrate	4	0.29610	1.12760	0.57953	0.37294
	SURFACE	Nitrite	4	0.00000	0.05190	0.02595	0.02996
	SURFACE	Selenium	4	-0.00016	0.00140	0.00057	0.00073
	SURFACE	TSI CHLOROPHYLL a	4	21.72112	35.59762	28.14558	6.63934
	SURFACE	TSI TOTAL PHOSPHORUS	4	37.35368	47.34886	39.85247	4.99759
	SURFACE	Total Phosphorus	4	0.01000	0.02000	0.01250	0.00500
	SURFACE	Total Solids	4	1.33000	3.25000	2.14500	0.82710
	SURFACE	Turbidity	4	2.60000	11.00000	5.22500	3.88362
	TOTAL SAMPLES		35	0.00000	53.19567	10.96961	16.05139
	Alkalinity		4	16.10000	28.00000	22.70000	5.02062
Oconee	BOTTOM	Ammonia	3	0.00000	0.02710	0.01183	0.01387
Oconee	BOTTOM	Calcium	4	4.77214	4.83770	4.79071	0.03099
Oconee	BOTTOM	Magnesium	4	1.71600	1.97200	1.85725	0.10598
Oconee	BOTTOM	Nitrate	4	0.08930	0.38940	0.24850	0.12518
Oconee	BOTTOM	Nitrite	4	0.00000	0.07970	0.04700	0.03369
Oconee	BOTTOM	TSI TOTAL PHOSPHORUS	4	37.35368	53.19567	46.31177	6.57740
Oconee	BOTTOM	Total Phosphorus	4	0.01000	0.03000	0.02000	0.00816
Oconee	BOTTOM	Turbidity	4	9.00000	33.00000	20.00000	11.83216
Oconee	MID	Alkalinity	35	0.00000	53.19567	24.98503	15.40835
Oconee	MID	Ammonia	4	17.20000	24.20000	21.32500	2.95452
Oconee	MID	Calcium	3	0.00000	0.03980	0.02587	0.02242
Oconee	MID	Magnesium	4	4.48800	4.81200	4.66457	0.14884
Oconee	MID	Nitrate	4	1.69100	1.99400	1.84320	0.12471
Oconee	MID	Nitrite	4	0.09070	0.37340	0.23508	0.11915
Oconee	MID	TSI TOTAL PHOSPHORUS	4	37.35368	53.19567	46.31177	6.57740
Oconee	MID	Total Phosphorus	4	0.01000	0.03000	0.02000	0.00816
Oconee	MID	Turbidity	4	6.20000	26.00000	12.95000	8.86548
Oconee	SURFACE	Alkalinity	139	-0.13350	152.00000	111.52277	19.77009
Oconee	SURFACE	Ammonia	12	17.40000	33.00000	23.96667	3.80701
Oconee	SURFACE	Calcium	9	0.00000	0.02970	0.01056	0.00999
Oconee	SURFACE	Turbidity	12	4.12200	5.50600	4.93847	0.38531

ALL VALUES IN MG/L EXCEPT CHLA WHICH IS IN UGL. TURBIDITY, WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL
TSI CALCULATIONS BASED ON CHLA AND TOTP VALUES GREATER THAN ZERO

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD. DEV.
Oconee	SURFACE	Chlorophyll a	12	-0.13350	2.09680	0.88829	0.69852
	SURFACE	Fecal Coliform	12	0.00000	152.00000	17.50000	42.72427
	SURFACE	Magnesium	12	1.57300	2.10800	1.92003	0.14084
	SURFACE	Nitrate	12	0.00000	0.36920	0.15226	0.12482
	SURFACE	TSI CHLOROPHYLL a	12	0.00000	0.05220	0.00852	0.01990
	SURFACE	TSI TOTAL PHOSPHORUS	11	11.44754	37.83269	27.72171	8.39150
	SURFACE	Total Phosphorus	11	37.35368	57.34404	52.20093	6.14240
	SURFACE	Turbidity	12	3.50000	0.04000	0.02750	0.01288
	SURFACE	TOTAL SAMPLES	88	-0.00480	47.34886	10.80000	5.43256
	SURFACE	Alkalinity	4	17.80000	28.50000	24.00000	9.97316
	SURFACE	Ammonia	3	0.00000	0.02240	0.00000	4.49963
	SURFACE	Arsenic	4	-0.00026	0.00067	0.00013	0.01207
Oliver	SURFACE	Bioch Oxygen Demand	3	0.63000	1.29000	0.89333	0.00045
	SURFACE	Cadmium	4	-0.00150	0.00337	-0.00066	0.34962
	SURFACE	Calcium	4	4.16200	7.26365	6.0891	0.00078
	SURFACE	Chlorophyll a	4	0.00000	1.21750	1.34160	0.00000
	SURFACE	Copper	4	-0.00090	0.00499	0.70398	0.57913
	SURFACE	Fecal Coliform	4	1.00000	5.00000	0.00185	0.00244
	SURFACE	Iron	4	0.13110	0.56720	0.27500	1.70783
	SURFACE	Lead	4	-0.00026	0.00338	0.26849	0.20093
	SURFACE	Magnesium	4	1.40200	1.80720	1.64505	0.00145
	SURFACE	Manganese	4	0.02050	0.05919	0.04067	0.01152
	SURFACE	Mercury	4	0.00001	0.00008	0.00004	0.00003
	SURFACE	Nickel	4	-0.00480	0.00197	-0.00013	0.00315
Oliver	SURFACE	Nitrate	4	0.28190	0.95120	0.52793	0.29394
	SURFACE	Nitrite	4	0.00000	0.05250	0.02608	0.03011
	SURFACE	Selenium	4	-0.00019	0.00093	0.00047	0.00051
	SURFACE	TSI CHLOROPHYLL a	3	22.97230	32.49967	29.10133	5.31838
	SURFACE	TSI TOTAL PHOSPHORUS	3	37.35368	47.34886	40.68540	5.77072
	SURFACE	Total Phosphorus	4	0.00000	0.02000	0.01000	0.00816
	SURFACE	Total Suspens. Solids	4	1.00000	3.75000	2.56250	1.16145
	SURFACE	Turbidity	4	2.40000	7.50000	3.97500	2.36837

ALL VALUES IN MG/L EXCEPT CHL_a WHICH IS IN UGL, TURBIDITY, WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL
TSI CALCULATIONS BASED ON CHL_a AND TOTP VALUES GREATER THAN ZERO

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD.DEV.
Rabun	SURFACE	TOTAL SAMPLES	32	0.00000	34.79154	4.71504	9.30671
Rabun	SURFACE	Alkalinity	3	7.50000	9.50000	8.56667	1.00664
Rabun	SURFACE	Ammonia	2	0.00300	0.00300	0.00300	0.00000
Rabun	SURFACE	Calcium	3	1.26900	1.47706	1.37669	0.10422
Rabun	SURFACE	Chlorophyll a	3	0.66570	1.53790	1.10773	0.43622
Rabun	SURFACE	Fecal Coliform	3	0.00000	15.00000	6.00000	7.93725
Rabun	SURFACE	Magnesium	3	0.46450	0.50680	0.48360	0.02145
Rabun	SURFACE	Nitrate	3	0.00000	0.09270	0.05847	0.05088
Rabun	SURFACE	Nitrite	3	0.00000	0.00000	0.00000	0.00000
Rabun	SURFACE	TSI CHLOROPHYLL a	3	26.57702	34.79154	31.01528	4.14708
Rabun	SURFACE	TSI TOTAL PHOSPHORUS	0	0.00000	0.00000	0.00000	0.00000
Rabun	SURFACE	Total Phosphorus	3	0.00000	0.00000	0.00000	0.00000
Rabun	SURFACE	Turbidity	3	0.95000	2.40000	1.68333	0.72514
Seed	SURFACE	TOTAL SAMPLES	33	0.00000	37.35368	4.95042	9.95132
Seed	SURFACE	Alkalinity	3	7.70000	9.10000	8.43333	0.70238
Seed	SURFACE	Ammonia	2	0.00220	0.00750	0.00485	0.00375
Seed	SURFACE	Calcium	3	1.31200	1.51537	1.39146	0.10873
Seed	SURFACE	Chlorophyll a	3	0.68530	0.88110	0.76243	0.10430
Seed	SURFACE	Fecal Coliform	3	0.00000	5.00000	2.00000	2.64575
Seed	SURFACE	Magnesium	3	0.47530	0.52680	0.49383	0.02862
Seed	SURFACE	Nitrate	3	0.00000	0.00000	0.00000	0.00000
Seed	SURFACE	Nitrite	3	0.00000	0.00000	0.00000	0.00000
Seed	SURFACE	TSI CHLOROPHYLL a	3	26.86169	29.32717	27.84913	1.30390
Seed	SURFACE	TSI TOTAL PHOSPHORUS	1	37.35368	37.35368	37.35368	1.30390
Seed	SURFACE	Total Phosphorus	3	0.00000	0.01000	0.00333	0.00577
Seed	SURFACE	Turbidity	3	0.80000	1.30000	1.06667	0.25166
Sinc. Cove	SURFACE	TOTAL SAMPLES	139	-0.06760	70.55695	13.76922	18.65741
Sinc. Cove	SURFACE	Alkalinity	12	15.70000	27.50000	24.10000	3.12788
Sinc. Cove	SURFACE	Ammonia	8	0.00000	0.01990	0.00836	0.00905

ALL VALUES IN MG/L, EXCEPT CHLA WHICH IS IN UGL., TURBIDITY, WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL
TSI CALCULATIONS BASED ON CHLA AND TOTP VALUES GREATER THAN ZERO

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD.DEV.
Sinc. Cove	SURFACE	Calcium	12	0.00750	5.38166	4.37817	1.41197
Sinc. Cove	SURFACE	Chlorophyll a	12	-0.06760	11.57450	2.97202	3.45656
Sinc. Cove	SURFACE	Fecal Coliform	12	0.00000	49.00000	18.25000	16.64673
Sinc. Cove	SURFACE	Magnesium	12	0.02200	2.24072	1.8422	0.58256
Sinc. Cove	SURFACE	Nitrate	12	0.00000	0.11330	0.04536	0.04875
Sinc. Cove	SURFACE	Nitrite	12	0.00000	0.07860	0.01130	0.02679
Sinc. Cove	SURFACE	TSI CHLOROPHYLL a	11	26.83589	54.59257	37.67039	9.49159
Sinc. Cove	SURFACE	TSI TOTAL PHOSPHORUS	12	47.34886	70.55695	56.85816	6.22361
Sinc. Cove	SURFACE	Total Phosphorus	12	0.02000	0.10000	0.04250	0.02179
Sinc. Cove	SURFACE	Turbidity	12	5.90000	34.00000	16.47500	8.24347
Sinclair	SURFACE	TOTAL SAMPLES	140	0.00000	63.19085	12.40598	17.80458
Sinclair	SURFACE	Alkalinity	12	16.40000	31.80000	22.80833	3.85710
Sinclair	SURFACE	Ammonia	8	0.00000	0.09020	0.02110	0.03102
Sinclair	SURFACE	Calcium	12	3.42800	5.55846	4.45657	0.64890
Sinclair	SURFACE	Chlorophyll a	12	0.50460	23.11510	3.97579	6.31414
Sinclair	SURFACE	Fecal Coliform	12	0.00000	31.00000	6.08333	10.46603
Sinclair	SURFACE	Magnesium	12	1.46500	2.28334	1.84250	0.22507
Sinclair	SURFACE	Nitrate	12	0.00000	0.18270	0.08343	0.07799
Sinclair	SURFACE	Nitrite	12	0.00000	0.07730	0.01142	0.02693
Sinclair	SURFACE	TSI CHLOROPHYLL a	12	23.85884	61.37819	37.57910	10.66832
Sinclair	SURFACE	TSI TOTAL PHOSPHORUS	12	37.35368	63.19085	53.303920	7.53481
Sinclair	SURFACE	Total Phosphorus	12	0.01000	0.06000	0.03333	0.01614
Sinclair	SURFACE	Turbidity	12	4.90000	40.00000	14.80833	11.40394
Tallulah	SURFACE	TOTAL SAMPLES	33	0.00000	71.93133	7.34444	15.94262
Tallulah	SURFACE	Alkalinity	3	7.90000	9.40000	8.46667	0.81445
Tallulah	SURFACE	Ammonia	2	0.00350	0.00490	0.00420	0.00099
Tallulah	SURFACE	Calcium	3	1.23700	1.42287	1.34196	0.09524
Tallulah	SURFACE	Chlorophyll a	3	0.36050	1.93660	1.10270	0.79204
Tallulah	SURFACE	Fecal Coliform	3	0.00000	42.00000	14.00000	24.24871
Tallulah	SURFACE	Magnesium	3	0.44980	0.50010	0.47147	0.02586

ALL VALUES IN MG/L, EXCEPT CHLA WHICH IS IN UGL, TURBIDITY, WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL.
TSI CALCULATIONS BASED ON CHLA AND TOTP VALUES GREATER THAN ZERO

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD. DEV.
Tallulah	SURFACE	Nitrate	3	0.00000	0.09550	0.05980	0.05211
	SURFACE	Nitrite	3	0.00000	0.00000	0.00000	0.00000
	SURFACE	TSI CHLOROPHYLL a	3	20.55988	37.05298	29.42973	8.31691
	SURFACE	TSI TOTAL PHOSPHORUS	1	71.93133	71.93133	71.93133	0.03667
	SURFACE	Total Phosphorus	3	0.00000	0.11000	0.03651	0.43589
	SURFACE	Turbidity	3	1.40000	2.20000	1.90000	
	SURFACE	TOTAL SAMPLES	34	0.00000	76.00000	9.15633	18.63702
Tugalo	SURFACE	Alkalinity	3	7.80000	9.10000	8.30000	0.70000
	SURFACE	Ammonia	2	0.00250	0.00420	0.00335	0.00120
	SURFACE	Calcium	3	1.05900	1.34835	1.19745	0.14508
	SURFACE	Chlorophyll a	3	1.24960	1.28520	1.26857	0.01791
	SURFACE	Fecal Coliform	3	0.00000	76.00000	25.33333	43.87862
	SURFACE	Magnesium	3	0.41310	0.49162	0.44874	0.03976
	SURFACE	Nitrate	3	0.00000	0.08240	0.02747	0.04757
Tugalo	SURFACE	Nitrite	3	0.00000	0.00000	0.00000	0.00000
	SURFACE	TSI CHLOROPHYLL a	3	32.75497	33.03055	32.90210	
	SURFACE	TSI TOTAL PHOSPHORUS	2	37.35368	60.56177	48.95772	0.13874
	SURFACE	Total Phosphorus	3	0.00000	0.05000	0.02646	0.02646
	SURFACE	Turbidity	3	1.20000	2.20000	1.63333	0.51316
	SURFACE	TOTAL SAMPLES	34	0.00000	47.34886	11.94335	15.97753
	SURFACE	Alkalinity	2	27.30000	28.00000	27.65000	0.49497
Worth	SURFACE	Ammonia	2	0.02390	0.04160	0.03275	0.01252
	SURFACE	Calcium	3	7.13600	7.96672	7.44765	0.45254
	SURFACE	Chlorophyll a	3	0.25990	3.36780	1.82600	1.15409
	SURFACE	Fecal Coliform	3	7.00000	29.00000	17.00000	11.13553
	SURFACE	Magnesium	3	1.23322	1.40900	1.33729	0.09225
	SURFACE	Nitrate	3	0.18870	0.29230	0.24353	0.05207
	SURFACE	Nitrite	3	0.00000	0.05070	0.03377	0.02924
Worth	SURFACE	TSI CHLOROPHYLL a	3	17.34999	42.48128	32.14568	13.14590
	SURFACE	TSI TOTAL PHOSPHORUS	3	47.34886	47.34886	47.34886	0.00000

ALL VALUES IN MG/L EXCEPT CHLA WHICH IS IN UGL, TURBIDITY, WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL
TSI CALCULATIONS BASED ON CHLA AND TOTP VALUES GREATER THAN ZERO

GPC RESERVOIR WATER QUALITY, 2001
RESERVOIR SUMMARY STATISTICS

RESERVOIR	DEPTH	ANALYTE	N	MINIMUM	MAXIMUM	MEAN	STD. DEV.
Worth	SURFACE	Total Phosphorus	3	0.02000	0.02000	0.02000	0.00000
Worth	SURFACE	Turbidity	3	9.00000	10.00000	9.50000	0.50000
Yonah	SURFACE	TOTAL SAMPLES	33	0.00000	37.35368	5.52830	10.81887
Yonah	SURFACE	Alkalinity	3	7.60000	8.60000	7.96667	0.55076
Yonah	SURFACE	Ammonia	2	0.00260	0.00490	0.00375	0.00163
Yonah	SURFACE	Calcium	3	1.10800	1.20450	1.16183	0.04921
Yonah	SURFACE	Chlorophyll a	3	0.67640	1.55040	1.14277	0.43995
Yonah	SURFACE	Fecal Coliform	3	0.00000	13.00000	4.66667	7.23418
Yonah	SURFACE	Magnesium	3	0.42310	0.46722	0.44394	0.02216
Yonah	SURFACE	Nitrate	3	0.00000	0.09270	0.03090	0.05352
Yonah	SURFACE	Nitrite	3	0.00000	0.00000	0.00000	0.00000
Yonah	SURFACE	TSI CHLOROPHYLL a	3	26.73345	34.87096	31.2476	4.16821
Yonah	SURFACE	TSI TOTAL PHOSPHORUS	1	37.35368	37.35368	37.35368	0.00000
Yonah	SURFACE	Total Phosphorus	3	0.00000	0.01000	0.00333	0.00577
Yonah	SURFACE	Turbidity	3	0.85000	2.90000	1.61667	1.11841

ALL VALUES IN MG/L EXCEPT CHLA WHICH IS IN UGL, TURBIDITY WHICH IS IN NTU, AND TSI WHICH IS NONDIMENSIONAL
TSI CALCULATIONS BASED ON CHLA AND TOP VALUES GREATER THAN ZERO



"Wiseman, Carol"
<Carol.Wiseman@wey
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02/22/2002 12:35 PM

To: Karrie-Jo Shell/R4/USEPA/US@EPA
cc: "Strandburg, Gary" <gary.strandburg@weyerhaeuser.com>, "Parker,
Willard (Flint River)" <willard.parker@weyerhaeuser.com>
Subject: RE: specific conductivity for the Flint River mill

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SUMMARY OF CHANGES TO WATER QUALITY STANDARDS
January 31, 2002

Section of Document	Action	Reason
SECTION I. GENERAL CONDITIONS		
I.2	<ul style="list-style-type: none"> - replaced “sanitary” with “environmental” - inserted “and scientific” - inserted “seasons of the year” - replaced “appraisal of such actual or potential damage to water use as may exist” with “assessment of water quality” - inserted “methodology specified in 40 CFR 136” 	clarification of meaning
I.4	inserted “Natural Conditions” language	to allow us to make judgement calls when assessing data collected at sites with unique natural water quality conditions
I.6	removed dissolved oxygen standard for open ocean waters	Section II.8 applies to all waters – not necessary to define standards for ocean waters separate from other state waters.
I.8	prohibited mixing zones in “habitats of threatened/endangered species”	Recommended by the U.S. Fish and Wildlife Service that mixing zones be prohibited in the habitats of threatened/endangered species
SECTION II. MINIMUM CONDITIONS APPLICABLE TO ALL WATERS		
II.3	<ul style="list-style-type: none"> - inserted “or dissolved” and inserted “sediment, turbidity” - inserted “Except as prohibited in Section I, Paragraph 8 above” - inserted clause added to allow turbidity exception 	<ul style="list-style-type: none"> - to reinforce the applicability of the “free froms” to violators of stormwater regulations - to clarify that the turbidity mixing zone in I.8 is not allowed in ecologically sensitive areas - for the environmentally beneficial use of dredge materials to rebuild wetlands
II.6	clarified that waters of higher uses should also support aquatic life by meeting the Fish and Wildlife criteria	a similar statement was in Section III.3 – Recreation. “The waters shall also be suitable for use for which waters of lower quality will be satisfactory.” This was reworded and moved from Section III.3 to Section II.6.
II.7	fecal coliform general conditions added	<ul style="list-style-type: none"> - to redefine secondary contact - to recognize wet weather influences
II.8	<ul style="list-style-type: none"> - dissolved oxygen language was condensed - sampling point locations reworded 	<ul style="list-style-type: none"> - to eliminate repetition - to better define where DO samples should be taken in ambient waters. Previous wording was confusing.

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Section of Document	Action	Reason
II.9	ⁱⁱ pH range and language revised	<ul style="list-style-type: none"> - to be more consistent with neighboring states - to clarify the intent of a one (1) pH unit change from background - to recognize naturally occurring low pH conditions in blackwater streams and acidic soils - to allow case-by-case variations
II.10	<ul style="list-style-type: none"> - coastal/estuarine temperature maximum defined as 90 F - inserted language applicable to instances when natural background temperatures exceed the maximum 90°F 	<ul style="list-style-type: none"> - 90°F maximum has previously meant to apply to coastal/estuarine waters, however, it did not clearly state so - to clarify that no increases are allowed by thermal dischargers when natural background temperatures exceed 90°F
II.11.C	added statement regarding ammonia toxicity	to reference EPA criteria documents when evaluating ammonia toxicity
II.11.G(2)(a) II.11.G(2)(b)	added “establishing TMDLs	to specify that EPA’s published water quality criteria recommendations should be considered in TMDL calculations when the state has no adopted numeric criteria
Table 1	<ul style="list-style-type: none"> - moved Appendix A from the end of the document to the toxics section and renamed it “Table 1”. ⁱⁱⁱtoxic criteria changes/updates ^{iv}Arsenic criteria – Human Health – recalculated 	<ul style="list-style-type: none"> - makes better sense to have the numeric toxics in the narrative toxics section of the document rather than at the end as an Appendix. - EPA requirement as part of all states’ triennial reviews - both values were recalculated assuming a different bioconcentration factor and assuming an inorganic fraction of arsenic in fish tissue
SECTION III. SPECIFIC WATER QUALITY CRITERIA		
III.1	'redefined “secondary contact” and moved the definition to Section II.7	to exclude full body contact activities.

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Section of Document	Action	Reason
III.1.A	<ul style="list-style-type: none"> - removed “when water contact recreation activities may be expected to occur” - established a minimum number of samples and an averaging period - replaced 2000 with 1000. - replaced 10% with 20% and 4000 with 2000. 	<ul style="list-style-type: none"> - to provide consistency with the revised definition of “secondary contact” - needed clarification in order to properly assess data to provide consistency with neighboring states
III.1.F III.1.G	<ul style="list-style-type: none"> - removed Phenolic Compounds criteria and removed Arsenic III, Cadmium, Chromium VI, Cyanide, Mercury, Selenium, and Silver - updated Barium, Fluoride, and Lead 	<ul style="list-style-type: none"> - not necessary to list them under PWS because the criteria protective of human health for water and organisms are already contained in Table 1. - to reflect EPA’s latest drinking water MCLs.
III.2	removed bacteria language under Shellfish Harvesting leaving a reference to the NSSP’s <u>Manual of Operations, Sanitation of Shellfish Growing Areas</u>	to eliminate the possibility of inconsistencies between the classification methodology and procedures used by the Department of Marine Resources to assess shellfish harvesting beds and the water quality standards
III.3	Reworded the statement “The waters shall also be suitable for use for which waters of lower quality will be satisfactory” and moved to Section II.6	clarification
III.3.A	<ul style="list-style-type: none"> - established a minimum number of samples and an averaging period - removed “nor shall more than 10% of the samples examined during any month exceed 400/100ml” 	<ul style="list-style-type: none"> - needed clarification in order to properly assess data - to remove the effective single sample maximum and apply the “steady state concept” which is referenced in the Bacteria section of the 1986 Gold Book.
III.4	same change as in III.1	same as III.1
III.4.A	<ul style="list-style-type: none"> - removed primary contact criteria - redefined bacteria criteria necessary to protect for secondary contact - established a minimum number of samples and an averaging period 	<ul style="list-style-type: none"> -inappropriate application – see Fact Sheet -to be consistent with other states -same as III.1.A.
III.4.D	removed Phenolic Compounds criteria	same as III.1.F and G
SECTION IV. DESIGNATED USES IN STATE WATERS		
IV. Coastal Basin	- added Back Bay of Biloxi, Big Lake, and Old Fort Bayou as Recreation waters	- to protect those waters for primary contact recreation

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Section of Document	Action	Reason
	- Combined Jourdan River segments and corrected “Dead Tiger” to “Bacon Bayou”	- correction
IV. Pascagoula River Basin	<ul style="list-style-type: none"> - reduced the extent of dissolved oxygen variance for Tallahala Creek - Relocated Simpson County Legion Lake to Pearl River Basin from Pascagoula Basin 	<ul style="list-style-type: none"> - to move the downstream point of the variance from Sholars (River Mile 27.7) to Tallahoma Creek, thereby reducing the size of the variance based on DO studies as part of the 1999 TMDL. - correction
IV. Pearl River Basin	<ul style="list-style-type: none"> - Added Shadow Lake in Scott County - Relocated Simpson County Legion Lake to Pearl River Basin from Pascagoula Basin 	<ul style="list-style-type: none"> - known recreational area - correction
Appendix A	moved to toxics section and renamed it “Table 1”	See Section II, Table 1

ⁱ There is a separate fact sheet titled “Bacteria” that describes the changes in more detail.

ⁱⁱ There is a separate fact sheet titled “pH” that describes the changes in more detail.

ⁱⁱⁱ There is a separate spreadsheet in which the criteria for all toxic parameters are calculated.

^{iv} There is a separate fact sheet titled “Arsenic” in which the calculations are explained.